查询CAT5110SBI-00-T供应商

CAT5110, CAT5118, CAT5119

32-Tap MiniPot™ Digitally Programmable Potentiometers with 2-Wire Interface

FEATURES

- 0.3µA Ultra-low supply current
- Single-supply operation: 2.7 V to 5.5 V
- Glitchless switching between resistor taps
- Power-on reset to midscale
- 2-Wire up/down serial interface
- Resistance values: 10kΩ, 50kΩ and 100kΩ
- Available in SC70 and SOT-23 packages

APPLICATIONS

- LCD screen adjustment
- Volume control
- Mechanical potentiometer replacement
- Gain adjustment
- Line impedance matching

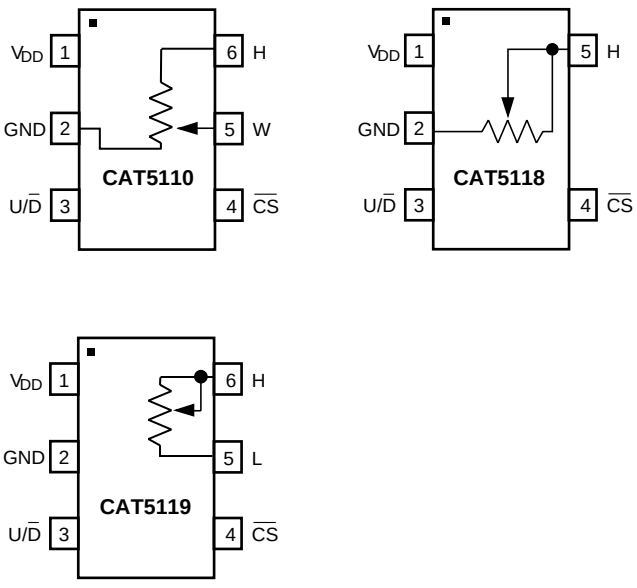
DESCRIPTION

CAT5110/5118/5119 linear-taper digitally programmable potentiometers perform the same function as a mechanical potentiometer or a variable resistor. These devices consist of a fixed resistor and a wiper contact with 32-tap points that are digitally controlled through a 2-wire up/down serial interface.

The CAT5110 is configured as a potentiometer. The CAT5118 and CAT5119 are configured as variable resistors. See *Pin Configurations* for part functionality.

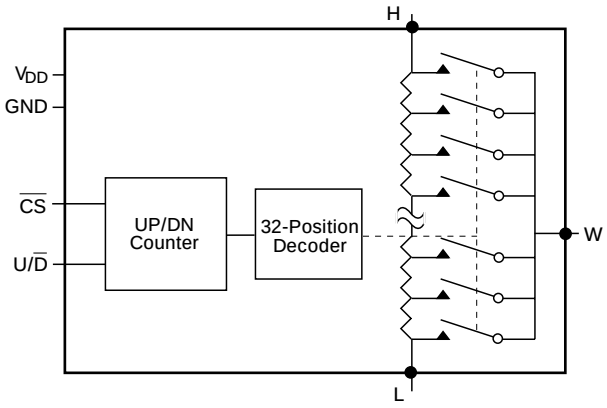
Three resistance values are available: 10kΩ , 50kΩ and 100kΩ. These are available in space-saving 5-pin and 6-pin SC70 and SOT-23 packages.

PIN CONFIGURE



Top View

FUNCTIONAL DIAGRAM



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PIN DESCRIPTION

Pin Number			Pin Name	Pin Function
CAT5110	CAT5118	CAT5119		
1	1	1	V_{DD}	Power Supply
2	2	2	GND	Ground
3	3	3	U/$\overline{D}$	Up/$\overline{Down}$ Control Input. With $\overline{CS}$ low, a low-to-high transition increments or decrements the wiper position.
4	4	4	$\overline{CS}$	Chip Select Input. A high-to-low $\overline{CS}$ transition determines the mode: increment if U/$\overline{D}$ is high, or decrement if U/$\overline{D}$ is low.
-	-	5	L	Low Terminal of Resistor
5	-	-	W	Wiper Terminal of Resistor
6	5	6	H	High Terminal of Resistor

ORDERING INFORMATION

Ordering Part Number	Resistor K	Top Mark	Pin Package	Parts Per Reel
CAT5110SBI-10-T	10	HW_	6 Lead SC70	3k
CAT5110SBI-10-T10	10	HW_	6 Lead SC70	10k
CAT5110TPI-10-T	10	HWYM	6 Lead SOT-23	3k
CAT5110TPI-10-T10	10	HWYM	6 Lead SOT-23	10k
CAT5110SBI-50-T	50	HX_	6 Lead SC70	3k
CAT5110SBI-50-T10	50	HX_	6 Lead SC70	10k
CAT5110TPI-50-T	50	HXYM	6 Lead SOT-23	3k
CAT5110TPI-50-T10	50	HXYM	6 Lead SOT-23	10k
CAT5110SBI-00-T	100	HY_	6 Lead SC70	3k
CAT5110SBI-00-T10	100	HY_	6 Lead SC70	10k
CAT5110TPI-00-T	100	HYYM	6 Lead SOT-23	3k
CAT5110TPI-00-T10	100	HYYM	6 Lead SOT-23	10k
CAT5118SBI-10-T	10	HN_	5 Lead SC70	3k
CAT5118SBI-10-T10	10	HN_	5 Lead SC70	10k
CAT5118TPI-10-T	10	HNYM	5 Lead SOT-23	3k
CAT5118TPI-10-T10	10	HNYM	5 Lead SOT-23	10k
CAT5118SBI-50-T	50	HP_	5 Lead SC70	3k
CAT5118SBI-50-T10	50	HP_	5 Lead SC70	10k
CAT5118TPI-50-T	50	HPYM	5 Lead SOT-23	3k
CAT5118TPI-50-T10	50	HPYM	5 Lead SOT-23	10k
CAT5118SBI-00-T	100	HR_	5 Lead SC70	3k
CAT5118SBI-00-T10	100	HR_	5 Lead SC70	10k
CAT5118TPI-00-T	100	HRYM	5 Lead SOT-23	3k
CAT5118TPI-00-T10	100	HRYM	5 Lead SOT-23	10k
CAT5119SBI-10-T	10	HT_	6 Lead SC70	3k
CAT5119SBI-10-T10	10	HT_	6 Lead SC70	10k
CAT5119TPI-10-T	10	HTYM	6 Lead SOT-23	3k
CAT5119TPI-10-T10	10	HTYM	6 Lead SOT-23	10k
CAT5119SBI-50-T	50	HU_	6 Lead SC70	3k
CAT5119SBI-50-T10	50	HU_	6 Lead SC70	10k
CAT5119TPI-50-T	50	HUYM	6 Lead SOT-23	3k
CAT5119TPI-50-T10	50	HUYM	6 Lead SOT-23	10k
CAT5119SBI-00-T	100	HV_	6 Lead SC70	3k
CAT5119SBI-00-T10	100	HV_	6 Lead SC70	10k
CAT5119TPI-00-T	100	HVYM	6 Lead SOT-23	3k
CAT5119TPI-00-T10	100	HVYM	6 Lead SOT-23	10k

ORDERING INFORMATION (CON'T)

Ordering Part Number	Resistor K	Top Mark	Pin Package	Parts Per Reel
CAT5110SDI-10-T	10	JU_	6 Lead SC70 green	3k
CAT5110SDI-10-T10	10	JU_	6 Lead SC70 green	10k
CAT5110TBI-10-T	10	JUYM	6 Lead SOT-23 green	3k
CAT5110TBI-10-T10	10	JUYM	6 Lead SOT-23 green	10k
CAT5110SDI-50-T	50	JV_	6 Lead SC70 green	3k
CAT5110SDI-50-T10	50	JV_	6 Lead SC70 green	10k
CAT5110TBI-50-T	50	JVYM	6 Lead SOT-23 green	3k
CAT5110TBI-50-T10	50	JVYM	6 Lead SOT-23 green	10k
CAT5110SDI-00-T	100	JW_	6 Lead SC70 green	3k
CAT5110SDI-00-T10	100	JW_	6 Lead SC70 green	10k
CAT5110TBI-00-T	100	JWYM	6 Lead SOT-23 green	3k
CAT5110TBI-00-T10	100	JWYM	6 Lead SOT-23 green	10k
CAT5118SDI-10-T	10	JL_	5 Lead SC70 green	3k
CAT5118SDI-10-T10	10	JL_	5 Lead SC70 green	10k
CAT5118TBI-10-T	10	JLYM	5 Lead SOT-23 green	3k
CAT5118TBI-10-T10	10	JLYM	5 Lead SOT-23 green	10k
CAT5118SDI-50-T	50	JM_	5 Lead SC70 green	3k
CAT5118SDI-50-T10	50	JM_	5 Lead SC70 green	10k
CAT5118TBI-50-T	50	JMYM	5 Lead SOT-23 green	3k
CAT5118TBI-50-T10	50	JMYM	5 Lead SOT-23 green	10k
CAT5118SDI-00-T	100	JN_	5 Lead SC70 green	3k
CAT5118SDI-00-T10	100	JN_	5 Lead SC70 green	10k
CAT5118TBI-00-T	100	JNYM	5 Lead SOT-23 green	3k
CAT5118TBI-00-T10	100	JNYM	5 Lead SOT-23 green	10k
CAT5119SDI-10-T	10	JP_	6 Lead SC70 green	3k
CAT5119SDI-10-T10	10	JP_	6 Lead SC70 green	10k
CAT5119TBI-10-T	10	JPYM	6 Lead SOT-23 green	3k
CAT5119TBI-10-T10	10	JPYM	6 Lead SOT-23 green	10k
CAT5119SDI-50-T	50	JR_	6 Lead SC70 green	3k
CAT5119SDI-50-T10	50	JR_	6 Lead SC70 green	10k
CAT5119TBI-50-T	50	JRYM	6 Lead SOT-23 green	3k
CAT5119TBI-50-T10	50	JRYM	6 Lead SOT-23 green	10k
CAT5119SDI-00-T	100	JT_	6 Lead SC70 green	3k
CAT5119SDI-00-T10	100	JT_	6 Lead SC70 green	10k
CAT5119TBI-00-T	100	JTYM	6 Lead SOT-23 green	3k
CAT5119TBI-00-T10	100	JTYM	6 Lead SOT-23 green	10k

ABSOLUTE MAXIMUM RATINGS

V_{DD} to GND..... -0.3 V to +6 V

All Other Pins to GND .....-0.3 V to (V_{DD} + 0.3) V

Input and Output Latch-Up Immunity..... ±200 mA

Maximum Continuous Current into H, L and W

100kΩ ..... ±0.6 mA

50kΩ..... ±1.3 mA

10kΩ..... ±1.3 mA

Continuous Power Dissipation (T_A = +70˚C)

5-pin SC70*..... 247 mW

6-pin SC70*..... 245 mW

Operating Temperature Range ..... -40°C to +85˚C

Junction Temperature .....+150˚C

Storage Temperature Range ..... -65˚C to +150˚C

Soldering Temperature (soldering, 10s) .....+300˚C

*(derate 3.1mW/˚C above T_A = +70˚C)

COMMENT

Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions outside of those listed in the operational sections of this specification is not implied. Exposure to any absolute maximum rating for extended periods may affect device performance and reliability.

ELECTRICAL CHARACTERISTICS

(V_{DD} = 2.7 V to 5.5 V, V_H = V_{DD}, V_L = 0, T_A = -40˚C to 85˚C. Typical values are at V_{DD} = 2.7 V, T_A = 25˚C, unless otherwise noted).

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DC Performance						
	Resolution		32			Taps
	End-to-End Resistance	CAT5110	80	100	120	kΩ
		CAT5118	40	50	60	
		CAT5119	8	10	12	
TC_R	End-to-End Resistance Tempco			200		ppm/˚ C
	Ratiometric Resistance Tempco			5		ppm/˚ C
INL	Integral Nonlinearity			±0.5	±1	LSB
DNL	Differential Nonlinearity				±1	LSB
	Full-Scale Error			±0.1		LSB
	Zero-Scale Error				1	LSB
R_W	Wiper Resistance			200	600	Ω
Digital Inputs						
V_{IH}	Input High Voltage		0.7 x V_{DD}			V
V_{IL}	Input Low Voltage				0.3 x V_{DD}	V
Timing Characteristics (Figures 1, 2)						
t_{CU}	U/$\overline{D}$ Mode to CS Setup		25			ns
t_{CI}	CS to U/$\overline{D}$ Step Setup		50			ns
t_{IC}	CS to U/$\overline{D}$ Step Hold		25			ns
t_{IL}	U/$\overline{D}$ Step Low Period		25			ns
t_{IH}	U/$\overline{D}$ Step High Period		25			ns
f_{TOGGLE}	Up/$\overline{Down}$ Toggle Rate (1)			1		MHz
t_{SETTLE}	Output Settling Time (2)	100kΩ variable resistor configuration, CL = 10pF		1		µs
		100kΩ potentiometer configuration, CL = 10pF		0.25		

ELECTRICAL CHARACTERISTICS

V_{DD} = 2.7 V to 5.5 V, $V_H = V_{DD}$, V_L = 0, T_A = -40°C to 85°C. Typical values are at V_{DD} = 2.7 V, T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Power Supplies						
V_{DD}	Supply Voltage		2.7		5.5	V
I_{DD}	Active Supply Current (3)				25	µA
I_{SD}	Standby Supply Current (4)	V_{DD} = +5V		0.3	1	µA

Notes:
1. Up/Down Toggle Rate:

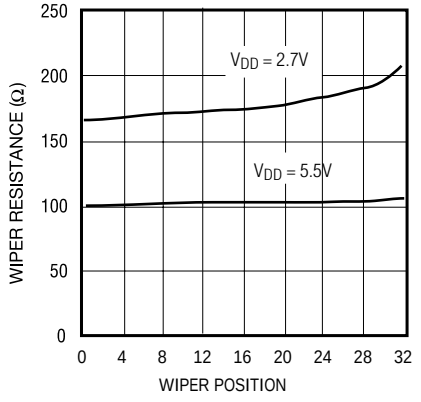
$$f_{TOGGLE} = \frac{1}{t_{SETTLE}}$$

2. Typical setting times are dependant on end-to-end resistance.
3. Supply current taken while changing wiper tap, f_{TOGGLE} = 1MHz.
4. Supply current taken while wiper position is fixed.

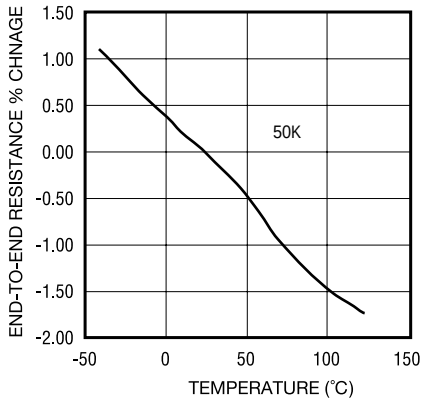
TYPICAL OPERATING CHARACTERISTICS

T_A = 25°C, unless otherwise noted.

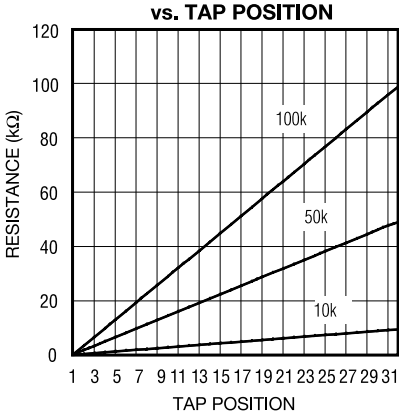
WIPER RESISTANCE vs. TAP POSITION



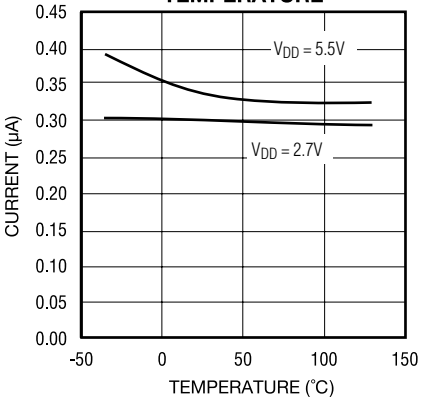
CHANGE IN END-TO-END RESISTANCE vs. TEMPERATURE



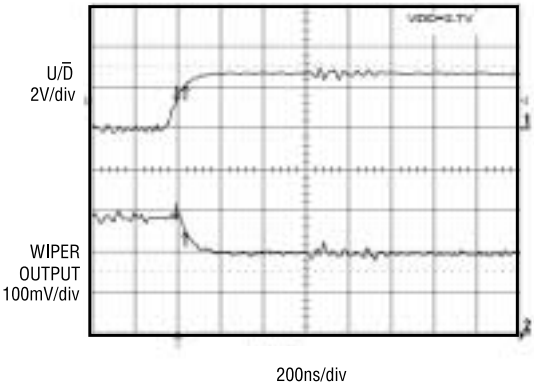
W-TO-L RESISTANCE vs. TAP POSITION



SUPPLY CURRENT vs. TEMPERATURE



TAP-TO-TAP SWITCHING TRANSIENT



FUNCTIONAL DESCRIPTION

The CAT5110/5118/5119 consist of a fixed resistor and a wiper contact with 32-tap points that are digitally controlled through a 2-wire up/down serial interface. Three end-to-end resistance values are available: 10kΩ, 50kΩ and 100kΩ.

The CAT5110 is designed to operate as a potentiometer. In this configuration, the low terminal of the resistor array is connected to ground (pin 2).

The CAT5118 performs as a variable resistor. In this device, the wiper terminal and high terminal of the resistor array is connected at pin 5. The CAT5119 is a similar variable resistor, except the low terminal is connected to pin 5.

Digital Interface Operation

The Minipots have two modes of operation when the serial interface is active: increment and decrement mode. The serial interface is only active when $\overline{CS}$ is low.

The $\overline{CS}$ and U/$\overline{D}$ inputs control the position of the wiper along the resistor array. When $\overline{CS}$ transitions from high to low, the part will go into increment mode if U/$\overline{D}$ input is high, and into decrement mode when U/$\overline{D}$ input is low. Once the mode is set, the device will remain in that mode until $\overline{CS}$ goes high again. A low-to-high transition at the U/$\overline{D}$ pin will increment or decrement the wiper position depending on the current mode (Figures 1 and 2).

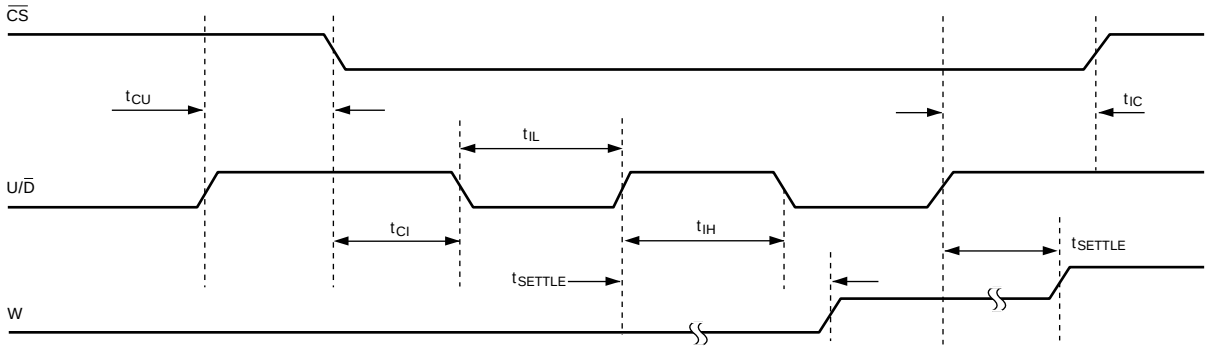
When the $\overline{CS}$ input transitions to high (serial interface inactive), the value of the counter is stored and the wiper position is maintained.

Note that when the wiper reaches the maximum (or minimum) tap position, the wiper will not wrap around to the minimum (or maximum) position.

Power-On Reset

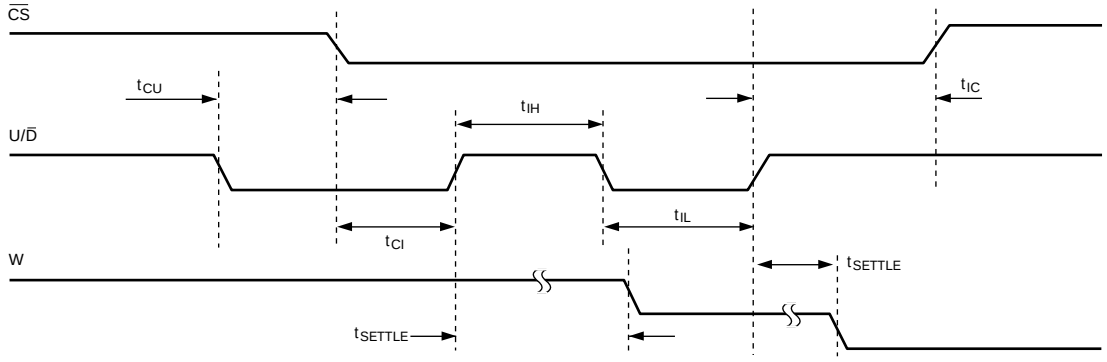
All parts in this family feature power-on reset (POR) circuitry that sets the wiper position to midscale at power-up. By default, the chip is in the increment mode.

Figure 1. Serial Interface Timing Diagram, Increment Mode



Note: "W" is not a digital signal. It represents wiper transitions.

Figure 2. Serial Interface Timing Diagram, Decrement Mode



Note: "W" is not a digital signal. It represents wiper transitions.

APPLICATIONS INFORMATION

The Minipots are intended for circuits requiring digitally controlled adjustable resistance, such as LCD contrast control, where voltage biasing adjusts the display contrast.

Alternative Positive LCD Bias Control

Use an op amp to provide buffering and gain on the output of the CAT5110. Connect the mechanical potentiometer to the positive input of a noninverting op amp (Figure 3) to select a portion of the input signal by digitally controlling the wiper terminal. Figure 4 shows a similar circuit for the CAT5119.

Adjustable Gain

Figure 5 shows how to use the variable resistor to digitally adjust the gain of a noninverting op amp configuration. Connect the CAT5119 in series with a resistor to ground to form the adjustable gain control of a noninverting amplifier. The Minipots have a low 5ppm/˚C ratiometric tempco that allows for a very stable adjustable gain configuration over temperature.

Figure 3. Positive LCD Bias Control

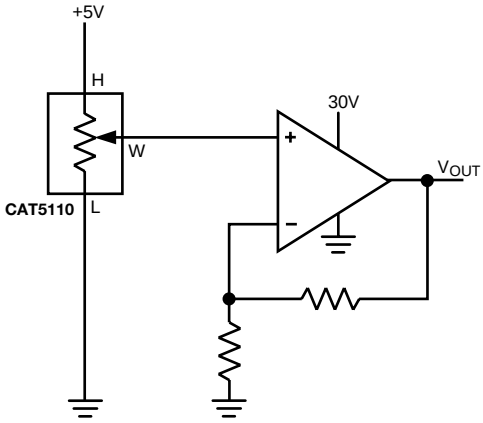


Figure 4. Positive LCD Bias Control

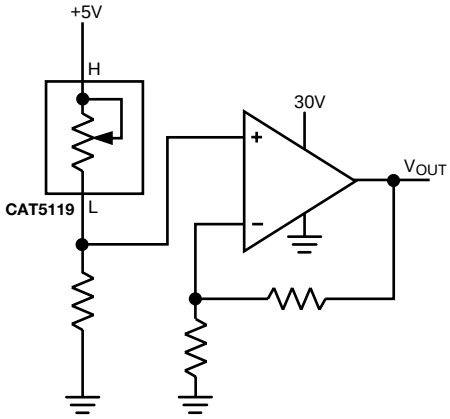


Figure 5a. Adjustable Gain Circuit

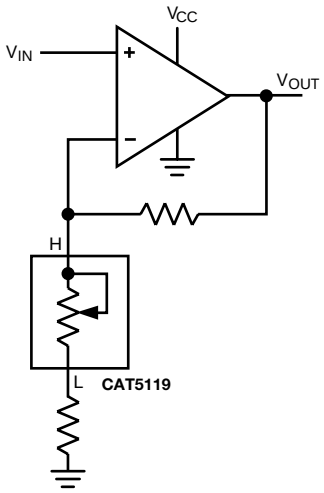
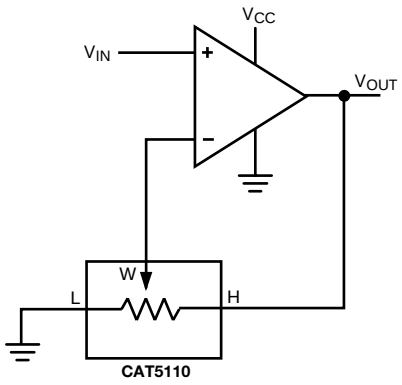
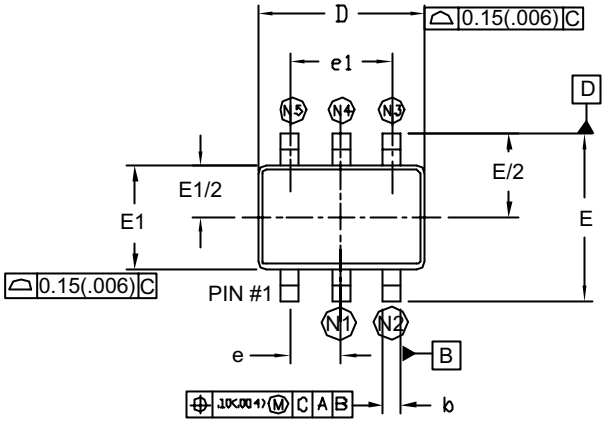
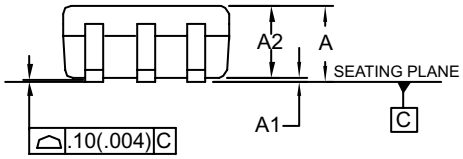


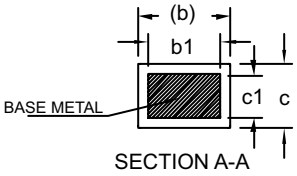
Figure 5b. Adjustable Gain Circuit

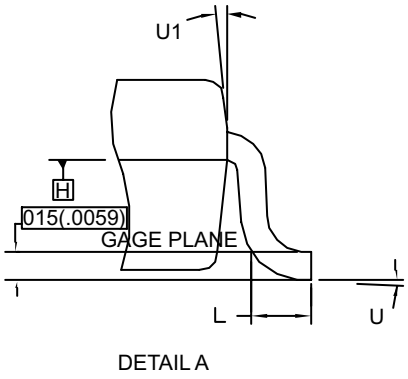


PACKAGE OUTLINES
SC70









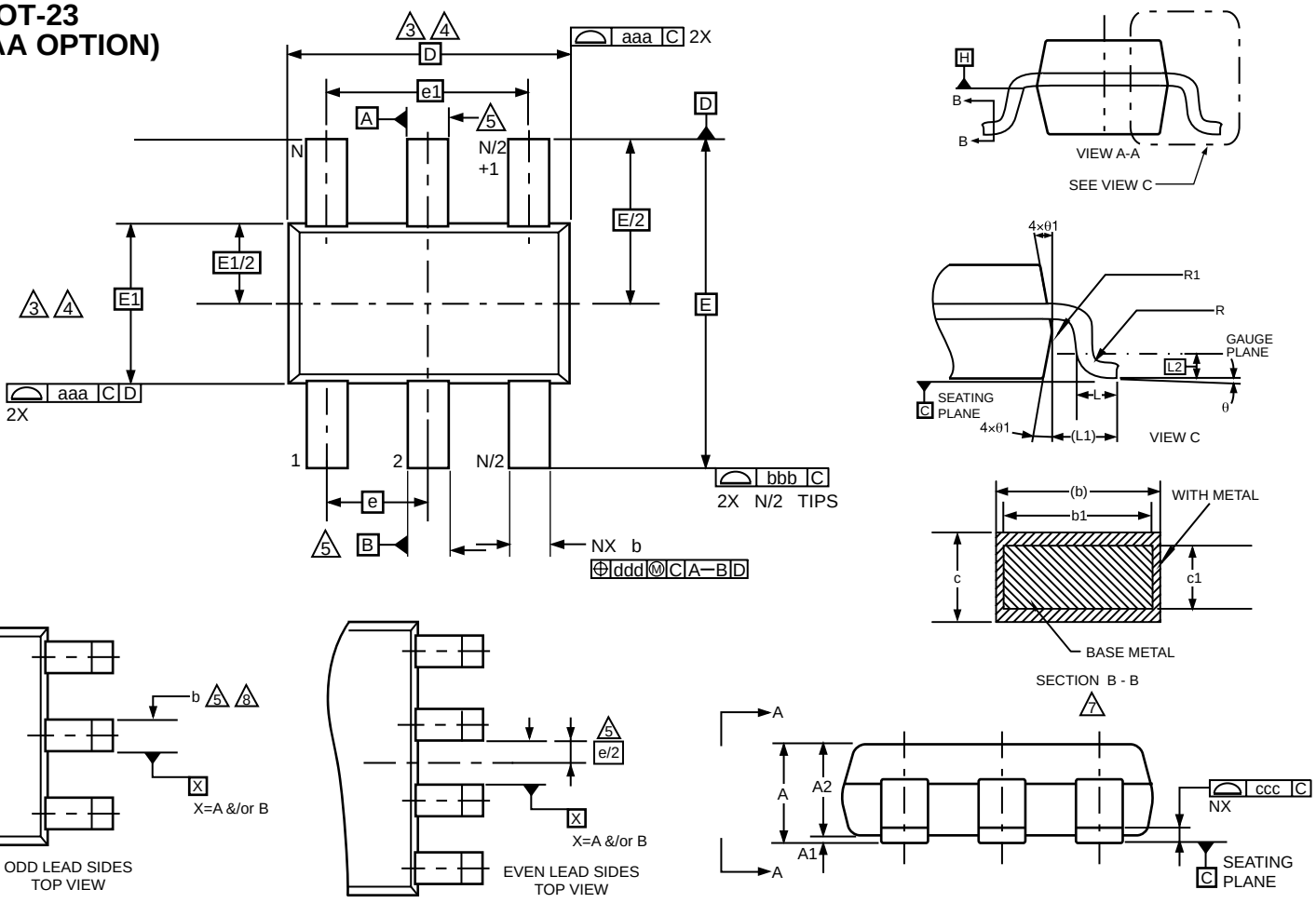
PIN CODE	LEAD COUNT	
	5	6
N1	2	2
N2	3	3
N3	4	4
N4	-	5
N5	5	6

SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	-	1.10	0.031	-	0.043
A1	0	-	0.10	0	-	0.004
A2	0.80	0.90	1.00	0.031	0.035	0.040
b	0.15	-	0.30	0.006	-	0.012
b1	0.15	0.20	0.25	0.006	0.008	0.010
c	0.08	-	0.25	0.003	-	0.010
c1	0.08	0.13	0.20	0.003	0.005	0.008
D	1.90	2.10	2.15	0.074	0.082	0.084
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.050	0.055
e	0.65 BSC			0.0255 BSC		
e1	1.30 BSC			0.0512 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
U	0°	-	8°	0-	-	8-
U1	4°	-	10°	4-	-	10-

NOTE:

1. CONTROLLING DIMENSION: MILLIMETER. CONVERTED INCH DIMENSION ARE NOT NECESSARILY EXACT.
2. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR. MOLD FLASH, PROTRUSION OR GATE BURR SHALL NOT EXCEED 0.15MM (0.006") PER END.
   DIMENSION "E1" DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15MM (0.006") PER SIDE.
3. THE PACKAGE TOP IS SMALLER THAN THE PACKAGE BOTTOM. DIMENSION D AND E1 ARE DETERMINED AT THE OUTERMOST EXPTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS ADN INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.

SOT-23 (AA OPTION)



All Dimensions are in Millimeters

	Min	Nom	Max	Notes
A	—	—	1.00	
A1	0.01	0.05	0.10	
A2	0.84	0.87	0.90	
c	0.12	0.15	0.20	7
c1	0.08	0.13	0.16	7
D	2.90BSC			3,4
E	2.80BSC			3,4
E1	1.60BSC			3,4
L	0.30	0.40	0.50	
L1	0.60REF			
L2	0.25BSC			
R	0.10	—	—	
R1	0.10	—	0.25	
θ	0°	4°	8°	
θ1	4°	10°	12°	

	Tolerances of Form and Position	Notes
aaa	0.15	1,2
bbb	0.25	1,2
ccc	0.10	1,2

Variations

	AA			6 AB			BA			
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Notes
b	0.30	—	0.45	0.30	—	0.45	0.22	—	0.36	7,8
b1	0.31	0.35	0.39	0.31	0.35	0.39	0.22	0.26	0.30	
e	0.95BSC			0.95BSC			0.65BSC			
e1	1.90BSC			1.90BSC			1.95BSC			
N	6			5			8			

Tolerances of Form and Position				
ddd	0.20	0.20	0.13	1,2

Notes:

1. Dimensions and tolerancing per ASME Y14.5M - 1994
2. Dimension are in mm.
3. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15mm per end. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.15mm per side. D and E1 dimensions are determined at Datum H.
4. The package top may be smaller than the package bottom. Dimensions D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, the bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body. D and E1 dimensions are determined at Datum H.
5. Datums A & B to be determined at Datum H.
6. Package varation "AB" is a 5 lead version of the 6 lead variation "AA" where lead #5 has been removed from the 6 lead "AA" variation.
7. These dimensions apply to the flat section of the lead between 0.08mm and 0.15mm from the lead tip.
8. Dimension "b" does not include dambar protrusion. Allowable dambar protrusion shall be 0.08mm total in excess of the "b" dimension at maximum material condition. The dambar cannot be located on the lower radius of the foot. Minimum space between protrusion and an adjacent lead shall not be less than 0.07mm.

REVISION HISTORY

Date	Rev.	Reason
3/10/2005	A	Initial Release

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